WHAT IS CLAIMED IS:

1. A device for measuring mechanical conditions comprising:

   a) a sensing element comprising a plurality of carbon nanotubes; and

   b) an electrical probe in contact with the plurality of carbon nanotubes.

2. The device of Claim 1, further comprising a database of information which correlates electrical measurements made with the electrical probe to mechanical conditions in a quantifiable manner based upon previously measured standards.

3. The device of Claim 1, wherein the electrical probe is a four-point probe.

4. The device of Claim 1, wherein the electrical probe measures a property selected from the group consisting of conductivity, resistivity, conductance, resistance, and combinations thereof.

5. The device of Claim 1, wherein the mechanical conditions are selected from the group consisting of displacement, impact, stress, strain, and combinations thereof.

6. The device of Claim 1, wherein the carbon nanotubes are selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, carbon fibrils, buckytubes, fullerene tubes, vapor-grown carbon fibers, and combinations thereof.

7. The device of Claim 1, wherein the carbon nanotubes have been refined so as to provide for a desired level of homogeneity among the carbon nanotubes, wherein said homogeneity is selected from the group consisting of uniform diameter, uniform length, uniform chirality, and combinations thereof.

8. The device of Claim 1, wherein the carbon nanotubes have been chemically modified.

9. The device of Claim 1, further comprising a plurality of carbon nanotubes assembled in a form selected from the group consisting of an array, a mat, a bucky-paper, and combinations thereof.

10. The device of Claim 1, wherein the carbon nanotubes are incorporated into a matrix material.

11. The device of Claim 1, wherein the carbon nanotubes are attached to a material.

12. The device of Claim 1, wherein said device is incorporated into an article of manufacture.

13. The device of Claim 12, wherein said article of manufacture is selected from the group consisting of airplanes, automobiles, engines, spacecraft, buildings, bridges, dams, gaskets, and combinations thereof.

14. The device of Claim 1, wherein said device is attached to an article of manufacture.

15. The device of Claim 14, wherein said article of manufacture is selected from the group consisting of airplanes, automobiles, engines, spacecraft, buildings, bridges, dams, gaskets, and combinations thereof.

16. The device of Claim 1, wherein the carbon nanotube(s) are arranged in a two-dimensional network.

17. The device of Claim 1, wherein the carbon nanotube(s) are arranged in a three-dimensional network.

18. A method of measuring mechanical conditions comprising:

a) selecting a plurality of carbon nanotubes;

b) attaching to the carbon nanotubes an electrical probe;

c) exposing the carbon nanotubes to a mechanical condition;

d) measuring a change in an electrical property of the carbon nanotubes with the electrical probe;

e) comparing this electrical property change to a database which correlates electrical property changes with mechanical conditions in a quantifiable manner; and

f) assigning a value to this mechanical condition based on this comparison.

19. The method of Claim 18, wherein the carbon nanotubes make up a sensing element that optionally comprises other materials selected from the group consisting of glass fibers, ceramic fibers, polymers, polymeric fibers, carbon fibers, nanotube fibers, spherical particles, and combinations thereof.

20. The method of Claim 18, wherein the electrical probe is a four-point probe.

21. The method of Claim 18, wherein the electrical probe measures a property selected from the group consisting of conductance, conductivity, resistance, resistivity, and combinations thereof.

22. The method of Claim 18, wherein the mechanical conditions are selected from the group consisting of displacement, stress, strain, and combinations thereof.

23. The method of Claim 18, wherein the carbon nanotubes are selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, carbon fibrils, buckytubes, fullerene tubes, vapor-grown carbon fibers, and combinations thereof.

24. The method of Claim 18, wherein the carbon nanotubes are in a form selected from the group consisting of an array, a mat, a buckypaper, and combinations thereof.

25. The method of Claim 18, wherein said method is used to sense mechanical conditions selected from the group consisting of displacement, impact, stress, strain, and combinations thereof.

26. A device for measuring mechanical conditions comprising:

a) a sensing element comprising a plurality of carbon nanotubes;

b) a source of electromagnetic radiation; and

c) a photoluminescence detector.

27. The device of Claim 26, wherein the carbon nanotubes are selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, carbon fibrils, buckytubes, fullerene tubes, vapor-grown carbon fibers, and combinations thereof.

28. The device of Claim 26, wherein the source of electromagnetic radiation is selected from the group consisting of monochromatic electromagnetic radiation sources, polychromatic electromagnetic radiation sources, lasers, and combinations thereof.

29. The device of Claim 26, wherein the photoluminescence detector detects in the electromagnetic spectral range of about 2μm to about 100 nm.

30. The device of Claim 26, wherein the photoluminescence detector is selected from the group consisting of one or more photodiodes, a photomultiplier tube, PbS, MCT, and combinations thereof.

31. The device of Claim 26, further comprising a spectral analyzer, selected from the group consisting of a prism, a grating, a monochrometer, at least one spectral filter, and combinations thereof, for performing spectral analysis.

32. The device of Claim 31, wherein said spectral analysis is multispectral.

33. The device of Claim 26, further comprising a database of information which correlates photoluminescence measurements made with the combination of a electromagnetic source and a photoluminescence detector to mechanical conditions in a quantifiable manner based on previously measured standards.

34. The device of Claim 26, wherein the mechanical conditions are selected from the group consisting of displacement, impact, stress, strain, and combinations thereof.

35. The device of Claim 26, wherein the carbon nanotubes have been refined so as to provide for a desired level of homogeneity among the carbon nanotubes, wherein said homogeneity is selected from the group consisting of uniform diameter, uniform length, uniform chirality, and combinations thereof.

36. The device of Claim 26, wherein the carbon nanotubes have been chemically modified.

37. The device of Claim 36, wherein such chemical modification is reversed.

38. The device of Claim 26, further comprising a plurality of carbon nanotubes assembled in a form selected from the group consisting of an array, a mat, a bucky-paper, and combinations thereof.

39. The device of Claim 26, wherein the carbon nanotubes are incorporated into a matrix material.

40. The device of Claim 26, wherein the carbon nanotubes are attached to a material.

41. The device of Claim 40, wherein said material is selected from the group consisting of polymers, glasses, metals, ceramics, semiconductors, alloys, fibers, and combinations thereof.

42. The device of Claim 26, wherein said device is incorporated into an article of manufacture

43. The device of Claim 42, wherein said article of manufacture is selected from the group consisting of airplanes, automobiles, engines, spacecraft, buildings, bridges, dams, gaskets, and combinations thereof.

44. The device of Claim 22, wherein said device is attached to an article of manufacture.

45. The device of Claim 44, wherein said article of manufacture is selected from the group consisting of airplanes, automobiles, engines, spacecraft, buildings, bridges, dams, gaskets, and combinations thereof.

46. The device of Claim 26, wherein the carbon nanotube(s) are arranged in a two-dimensional network.

47. The device of Claim 26, wherein the carbon nanotube(s) are arranged in a three-dimensional network.

48. A method of measuring mechanical conditions comprising the steps of:

a) selecting a plurality of carbon nanotubes;

b) irradiating said plurality of carbon nanotubes with a source of electromagnetic radiation;

c) exposing the carbon nanotubes to a mechanical condition;

d) measuring a change in the photoluminescence properties of the carbon nanotubes with a detector as a result of them being exposed to a mechanical condition;

e) comparing this photoluminescence change to a database which correlates photoluminescence changes with mechanical conditions in a quantifiable manner; and

f) assigning a value to this mechanical condition based on this comparison.

49. The method of Claim 48, wherein the carbon nanotubes make up a sensing element that optionally comprises other materials selected from the group consisting of glass fibers, ceramic fibers, polymers, spherical particles, and combinations thereof.

50. The method of Claim 48, wherein the photoluminescence probe measures a change in photoluminescence properties selected from the group consisting of fluorescence, phosphorescence, and combinations thereof.

50. The method of Claim 48, wherein the step of measuring a change in the photoluminescence properties of the carbon nanotubes further comprises analyzing with a spectral analyzer.

51. A device for measuring mechanical conditions comprising:

a) sensing element comprising a plurality of carbon nanotubes; and

b) a thermal conductivity probe.

52. The device of Claim 51, further comprising a source of thermal energy.

53. The device of Claim 51, wherein the mechanical conditions are selected from the group consisting of displacement, impact, stress, strain, and combinations thereof.

54. The device of Claim 51, wherein the thermal conductivity probe comprises a thermocouple.

55. The device of Claim 51, wherein said device is incorporated into a material selected from the group consisting of polymers, glasses, metals, ceramics, semiconductors, alloys, fibers, and combinations thereof.

56. The device of Claim 51, wherein said device is incorporated into an article of manufacture

57. The device of Claim 56, wherein said article of manufacture is selected from the group consisting of airplanes, automobiles, engines, spacecraft, buildings, bridges, dams, gaskets, and combinations thereof.

58. The device of Claim 51, wherein said device is attached to an article of manufacture.

59. The device of Claim 58, wherein said article of manufacture is selected from the group consisting of airplanes, automobiles, engines, spacecraft, buildings, bridges, dams, gaskets, and combinations thereof.

60. A method for measuring mechanical conditions comprising the steps of:

a) selecting a plurality of carbon nanotubes;

b) exposing some of the carbon nanotubes to a source of heat;

c) exposing the carbon nanotubes to a mechanical condition;

d) measuring a change in the thermal conductivity properties of the carbon nanotubes with a thermal conductivity probe;

e) comparing the change in thermal conductivity properties to at least one database capable of correlating changes in thermal conductivity properties with mechanical conditions in a quantifiable manner; and

f) assigning a value to this mechanical condition based on this comparison.

61. The method of Claim 60, wherein the thermal conductivity probe is a thermocouple.